THE NATURE CONSERVANCY NEWS

July/August 1980

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THE NATURE CONSERVANCY NEWS

VOLUME 30, NUMBER 4
JULY/AUGUST, 1980

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COVER: A Florida morning in the Conservancy's Cummer Sanctuary of the Suwannee River. Photo by Tim Loomis.

The Nature Conservancy is a national conservation organization committed to the preservation of natural diversity by protecting lands containing the best examples of all components of our natural world.

To date the Conservancy and its members have been responsible for the preservation of 1,634,542 acres of forests, marshes, prairies, mountains, and islands: home to rare and endangered species of wildlife and plants. 2,363 projects have been completed since the acquisition of the first preserve in 1954. Approximately 60% of all preserves are retained by the Conservancy and managed by volunteer land stewards.

A membership, non-profit organization, the Conservancy was incorporated in 1951 in the District of Columbia for scientific and educational purposes.

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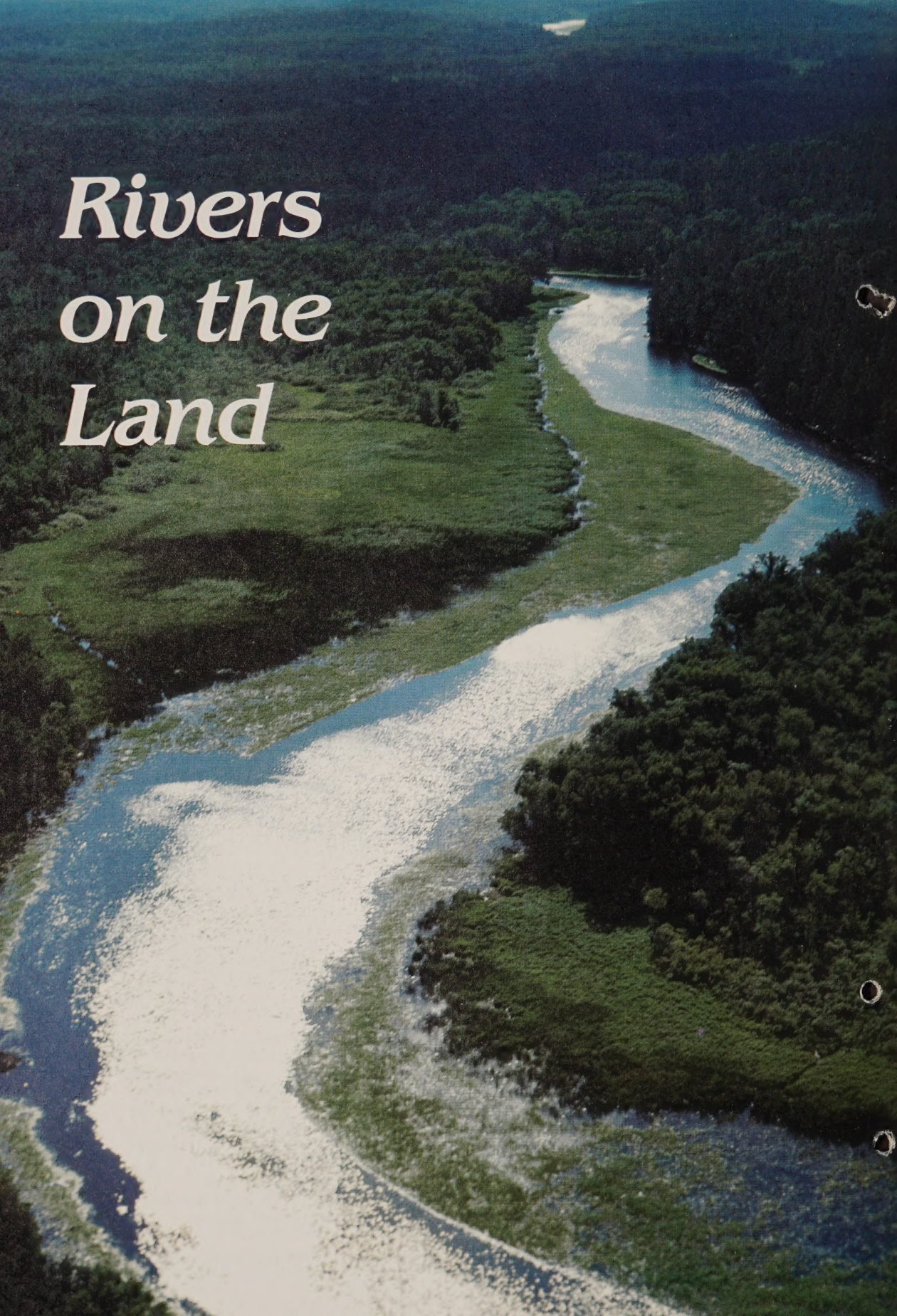
Rivers
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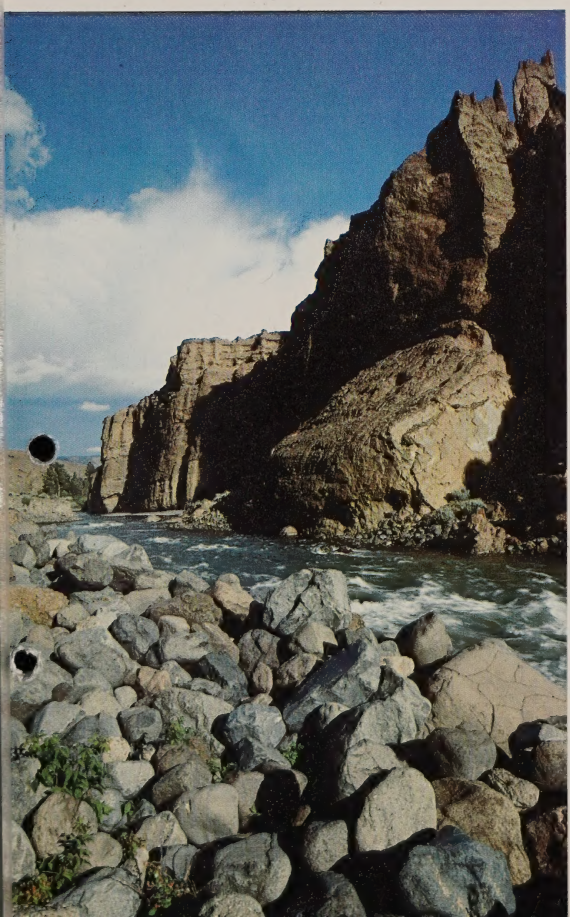


by Tim Palmer

If you want a thrill in the Rockies, you climb to a mountaintop. But in Pennsylvania where I live, you "climb" to the bottom—a river bottom. In this part of the country, the river is the main feature, the highlight of the land.

I reach my favorite stream by dropping about 800 feet on a breakneck trail through an Appalachian gorge. And there is the river . . . mysterious in morning mist, eager in afternoon sunshine, reflective in golden evening light. There is a kind of magnetism that rivers exert over people: we love water, especially when it is animated. The stream churns, riffles, hisses onto a sandy beach; boils into holes and haystacks; clatters when lifting a bedload of stone. Or it can run silently and peacefully, soothing us with its serenity. Yet in a river's grasp is the ability to sculpt and shape continents and house entire ecosystems.

Water-to-the-sea

The hydrologic cycle appears to be so basic. As young children we learn about it: water from the oceans evaporates, circles the earth in a loft of wind, and rises to great heights where it cools and condenses. Then snow piles on the mountains and rain soaks the plains and valleys. Later, the same water bursts from a spring, for example, and courses away with other streams, downhill to the edge of the continent. It is this aspect of the cycle, the path of water-to-the-sea, that most catches my interest. Whether they emanate from a lake, a mountain spring, or simply run-off from higher ground, the rivers of America pass through 3 million miles before ending in ocean waters.

The waterways have infiltrated most corners of North America. Streams scour these paths, rinsing a bed of soil or rock, over and over again lowering the level of the continent one foot in 10,000 years, according to hydrologist Marie Morisawa. Valleys and canyons gradually deepen, causing a faster flow of water and more stream-bed abrasion. A V-shaped track of erosion creeps upward toward a higher piece of land between peaks of the Sierras, Rockies, the Ozarks, and Appalachians—everywhere that rivers run. The tangled topography seems chaotic but is ordered by the consistency of gravity.

The land and the river are partners, always interacting, a relationship best shown by floods. With heavy spring runoffs, the stream swells and speeds, rising in its banks. After two days of rain, the river's established course cannot contain the extra

water—an opaque-brown surfeit tops the edge to spill over the land. Though canyon floods are crushing in velocity, most rivers overflow in a tranquil way, covering the floodplain with slack water. Mud carried by these waters settles to the ground, adding fertile soil to the floodplain and causing the remaining water to retreat slowly to the river.

While flooding rivers deposit soil in the lowlands, in other areas they carve up the land, moving rock in the Grand Canyon or taking 40 feet of Mississippi loam in one night. Over many years, as the rivers cleave and scour the land, they change their routes. Old channels can be seen by the dip of swales, low-wooded swamps, and oxbow lakes. And the flowing river waters determine not only the course of their channels, but the patterns of their stream beds as well. Steep pitches of the river are cobbled and rocky; flattened reaches are pooled or eddied where a gentle current drops its load, large stones first, smallest grains last as the water movement wanes. An island discloses this design: there may be watermelon-sized rocks at the upstream side, graded to smaller cobbles, then gravel, pebbles, sand, and finally silt at the downstream lower end, where channels from both sides of the island join and eddy backward.

Layers of Life

The riverbank is a very special habitat for myriad plants and animals. Certain species of trees are river-dependent and thrive in the silty or sandy alluvial soil of the bank: silver maple in the East, cottonwood on the Great Plains, and cedar in the Northwest. Hemlocks, sycamores, and willows may also line the stream banks, some stretching out their branches, shading trout pools from the summer sun. Providing a mixture of cover and openings, as well as abundant forage, the water's edge is a place of high activity. It serves, for instance, as the boundary where nimble-fingered raccoons feel among the rocks for crayfish, and mammoth grizzly bears slap the waters for salmon. Spotted sandpipers and yellowlegs feed just above the waterline, while herons and egrets wade below it, in search of a meal. The steeply cut banks of some waterways offer homes for nesting swallows, which eat insects that thrive near the water.

The stream itself is layered with life. Warm shallows harbor frogs and darting minnows; cold pools are ideal for trout; riffles are aerated for the caddisflies, mayflies, and other insects. Basic ingredients in the riverine food chain, algae exist as a slime on rocks or as a green wave of filaments. Small insects and other invertebrates are the primary consumers of algae, converting it into animal tissue. They, in turn, are eaten by secondary consumers, such as minnows and dragonflies. And so it goes through the food chain—mature fish eat the dragonflies, ospreys or otters eat the fish.

This delicate balance, which holds life for the creatures of the river, is often upset by human interference. Pesticides flowing from lands to streams are ingested by primary consumers, which are, themselves, ingested by higher animals, including people. Poured indiscriminately into rivers, raw sewage attracts microorganisms that absorb oxygen, leaving little for the fish. Or, when a stream is polluted by acid drainage from coal mines, most aquatic life is totally eliminated—an impact that may last hundreds of years.

Altering the structure of a stream is just as destructive as polluting its waters. Bulldozing, channelization, or dredging eliminates the shallows needed by spawning fish and river-edge wildlife. Pools and riffles (necessary combinations for cold-water cover and insect reproduction) and natural shorelines, with shade, eddies, and their own biota, are all destroyed. And when a river is dammed for a reservoir, a natural habitat—with its related plants and wildlife—is replaced by an artificial one. An ecosystem dependent on moving water will not survive in still water.

For example, salmon — like steelhead trout, shad, and other anadromous fishes—migrate from the sea to the rivers, sometimes traveling as far as 2,000 miles. Migrating upriver is the only way that these creatures can reach their spawning

Wildlife in and around the river. Left: a southern leopard frog; top: the great blue heron, a tall wading bird, stalks the shallows for food; above: nature's paddle-tailed master builder, the beaver.

ground to reproduce; but dams now block their passages. Even fish ladders on Washington's and Oregon's Columbia River do not ensure passage for most salmon. Other streams have no ladders at all. Of the young fish that hatch, up to 80 percent are lost on the return trip to the sea, victims of irrigation ditches. Today's salmon run is a ghost of the one that supported northwest Indians. Mainly because of dams, one of America's best known fish is often relegated to the plumbed culture of a fish and game department hatchery, and sport fishing is now prohibited on many streams.

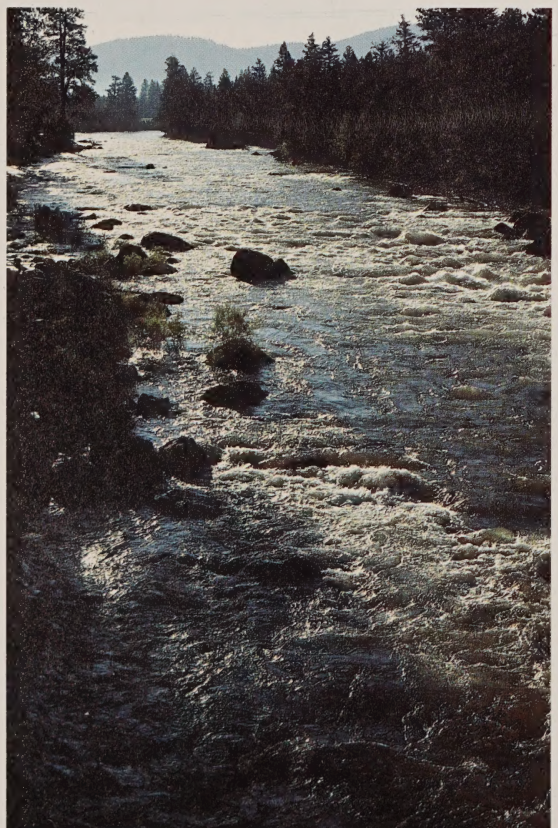
Grand Canyon of the East

Pine Creek, which is being studied for designation as a scenic river, grows from mountain springs, collects branches, and then plunges through a 17-mile canyon. Known as the "Grand Canyon of Pennsylvania," its rocky hemlock-shaded slopes drop 1,000 feet to the stream below. About two dozen tributaries sprout from the creek, their cold waters stocked with trout. After leaving the canyon, Pine Creek enters a broad valley of floodplains and snakes along for about 30 miles before emptying into the west branch of the Susquehanna River. In the meadowed valley, the stream's walls are still somewhat steep—locally they are called "side hills." Unfortunately, in areas where the "side hills" are *not* so high, Pine Creek

is crowded with cottages and seasonal homes. Trailers, mobile homes, A-frames, and cabins dot its banks. Despite frequent flooding, the structures always reappear. But the problem is not quite as severe as it could have been.

Ten years ago a particular Pine Creek landowner divided his property into tiny parcels and rented them. Running for one-and-a-half miles along the river, the tracts each contained about 100 feet of riverfront. In addition to the rural development that followed, it was discovered that raw sewage was creeping into Pine Creek.

Fortunately, the trend has been reversed. Starting with a study that was sponsored by Trout Unlimited and the America the Beautiful Fund, it was decided that the most critical areas of land along the creek must be saved. The Nature Conservancy purchased the parceled-up property, which contained 500 acres, and the Commonwealth of Pennsylvania acquired other tracts. During the last eight years, 4,000 acres of undeveloped land along Pine Creek have been added to nearby state forests. The creek may be emblematic of rural riverfront development, and success in protecting this stream offers some hope that the interface of river and landscape may be recognized and safeguarded.



The Conservancy has acquired a number of conservation easements protecting wildlife habitat along Montana's Blackfoot River.

The Nature Conservancy's efforts to preserve a bit of Pine Creek are small when compared to its endeavors and successes elsewhere in the country: the Pascagoula River in Mississippi . . . Idaho's (and Ernest Hemingway's) Silver Creek . . . Mianus River Gorge in New York, the first Conservancy project . . . Tiger Creek and the Suwannee River in Florida . . . the conservation easements along Montana's Blackfoot River . . . Big Creek in California and the Skagit in Washington. . . .

In addition to private efforts, the National Wild and Scenic Rivers System is an important means of protecting some waterways. The intent of the system is to prevent damaging federal projects such as dams, and—if needed—to buy land or acquire easements. At the same time, the program attempts the most effective protection without high public costs or displacement of landowners. Its primary objective is neither to regain wilderness nor to establish parks, but rather to keep high quality streams as they are. It is a formidable challenge for federal and state agencies, which have been accustomed to gaining control through large acquisition programs.

Due in part to the efforts of planners and citizen groups—such as the American Rivers Conservation Council—easements, zoning, and accommodation of existing private development are now recognized as important parts of the National Rivers System plans. Also, 27 states have their own scenic river systems. Although their prohibition of major water projects is less effective, they offer a significant alternative to federal involvement.

The waterways of America are central to our history and our way of life. Lewis and Clark, LaSalle, Pontiac, Champlain, Mark Twain, John Wesley Powell . . . they were all river people. And today our rivers mean urban relief and recreation: rafters and kayakers on the whitewater Youghiogheny of Pennsylvania increased from 5,000 to 120,000 in the past 11 years. But most fundamentally, America's rivers mean life—a place and provision for countless plants and animals. Whether they flourish in the dark, slow waters of the Suwannee or by the frothy Colorado, wild things are holding on, dependent for survival on the waters that flow from the mountains to the sea.

Tim Palmer worked for Lycoming County in northern Pennsylvania for seven years doing environmental planning, including wild and scenic river studies. Now a free-lance writer and photographer, he authored a book on the rivers of Pennsylvania (Pennsylvania State University Press) and is currently writing another about California's Stanislaus River for the University of California Press.

McCloud River

by Fayette Krause / photographs by Tom Hesseldenz

Snowman's Hill, a pass on California State Highway 89, crests at 4,200 feet before dropping to the town of McCloud, over 1,000 feet below. If you don't cross the pass in winter, it appears strikingly misnamed, for even by late March the only snow in sight is on Mt. Shasta, rising majestically a dozen miles to the north. The dry pine forests lining the road may fool outsiders, but not those townspeople who remember the winter of 1938. That February seven feet of snow sealed the town off for thirteen days.

Local self-sufficiency, characteristic of most small towns through World War II, served the McCloud community well during the great blizzard. The dairy and bakery continued production and, with the company store's larder, provided the necessities until the bakers exhausted their yeast supply. Crack cross-country skiiers were then sent over Snowman's Hill to replenish the leaven and supply other essentials until road contact could be reestablished with the outside world.

Forty years later technological advances make it difficult to imagine McCloud's prolonged isolation. Yet, just fifteen miles south of the town, The Nature Conservancy's McCloud River Preserve offers a less ephemeral solitude to people willing to negotiate the ruts and dodge the rocks that pepper the last seven miles of road leading to the sanctuary.

The trip is worth the effort. At the road's end visitors enter a northern California similar to that known by the Wintu Indians, inhabitants of the McCloud drainage over a century ago. A path along the water leads a short distance to the preserve cabin, the last human outpost on the six and one-half mile stretch of riverfront owned by the Conservancy. A brief, self-guiding nature trail immediately adjacent to the cabin provides an intro-

duction to the area's vegetation. At the beginning of the trail a sign reorders values in a manner puzzling to some, but it clearly states the basis on which visitors are welcome:

Rattlesnakes
Scorpions
Black bear
Poison oak

. . . ARE PROTECTED
DO NOT HARM OR DISTURB

Poison oak? Truly this is the ultimate statement in honoring and protecting the preserve's ecology.

From the nature trail a path leads southwest along the river, and for the next two miles signs of human impact recede. Hikers traverse virgin stands of Douglas fir. When the trail climbs it crosses substantial pine/oak forests and open hillsides with exposed, crumbly soil—the latter harboring a number of showy spring wildflowers that brighten the parched background. Finally, the preserve's lower four miles are closed to the public. Here wilderness remains unchallenged.

The continuum from greater to lesser human intervention produces a healthy mix. Interpretation is an important component of the preserve's program, but equally beneficial is the opportunity for keen-eyed visitors to make ecological observations and draw their own conclusions. Perhaps most significant is the sanctuary within the preserve where people may not enter. Implicit in this policy is the belief that life forms other than *Homo sapiens* have intrinsic worth and rights parallel to those of humans—a worth not lesser than, but only differing in kind from those we assign to ourselves.

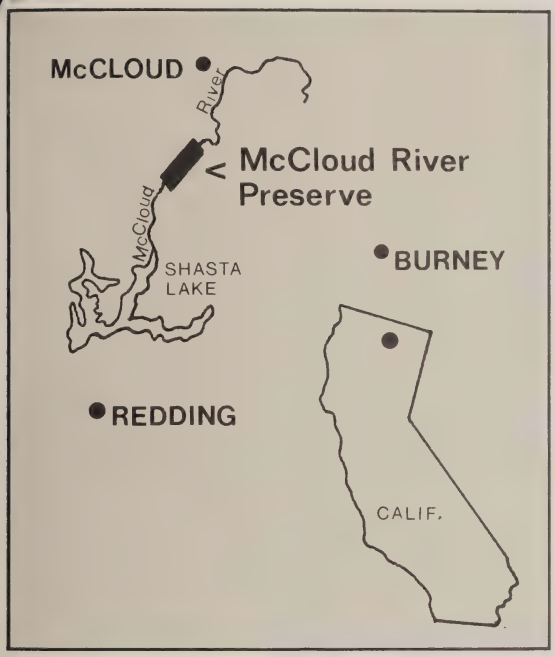
How did the McCloud maintain its nearly pristine character through the mid-20th Century? It is a rugged and relatively inaccessible place to begin with, but more importantly the land ownership pattern impeded development. As early as 1900 private fishing clubs owned much of the riverfront. One of these, the McCloud River Club, donated 2,330 acres to the Conservancy in 1973.

In accepting the gift the Conservancy adopted an innovative management plan that harmonized its policy with the area's established use. The Conservancy excludes fishing on many of its holdings. Rather than totally prohibiting angling on the McCloud, however, the Conservancy opted for an arrangement permitting true sport fishing while preventing depletion of the resource. As an experiment, the preserve's upper two and one-half miles remain open to anglers on a catch and release basis. No fish from Conservancy waters legally end in a creel. To further even the odds between predator and prey, the preserve committee outlawed

Top: entering the Conservancy's McCloud River Preserve; above: the dipper or water ouzel flies from rock to rock amid rushing waters, occasionally diving for insects. Pictured here by its nest, which is camouflaged with a layer of growing moss.

barbed and multiple hooks, limited the number of anglers to ten per day with pre-registration mandatory, and closed fishing in the four-mile downstream portion of Conservancy property. Two preserve managers, who work full-time during the six-month fishing season, monitor the preserve and enforce Conservancy regulations.

Shortly after the preserve's establishment the Conservancy made an exciting discovery. Anglers caught a fish called the Dolly Varden in preserve waters, a char previously believed extinct in California. With strong Conservancy support the California Fish and Game Commission established a Dolly Varden preserve in Conservancy waters and dedicated the entire McCloud River as a Wild Trout Stream. The importance of these designations cannot be over-estimated: they provide the leverage for future defense of the natural area's riparian system, should it be necessary.



While the fishery is important, the Conservancy's interest is in the total system. The mature coniferous forest hosts the pileated woodpecker, a bird dependent upon old-growth timber. Pileateds are not numerous in California, but the oblong holes in tree snags scattered throughout the preserve offer silent testimony to their presence. They also underscore the importance of dead and dying timber, used by many species for foraging, nesting, and denning.

Of all the deciduous trees the California black oaks seem most reluctant to acknowledge spring's arrival—boon for birdwatchers, since black-throated gray, yellow-rumped, and Townsend's warblers feed openly on the unleafed limbs, providing uncommon opportunities for unobstructed observation. Whether it be a vertical ascent to snatch an airborne insect or diligent examination of branches for caterpillars and spiders, the speed with which the warblers work is awesome. Their ceaseless activity demonstrates the important role birds play in regulating insect populations and illustrates nature's system of checks and balances.

McCloud's canines and felines symbolize its wilderness character. Coyotes stalk rodents, but are not often seen in the dense forest. Fur-filled scats found on game trails more frequently indicate this canine's presence. Both bobcat and mountain lion roam the sanctuary and adjacent lands. Bobcats feed on a variety of small mammals, while cougars prey primarily on mule deer, common in the preserve. The cats are rarely sighted, but in winter they leave more evident calling cards: tracks and kills framed in the fresh snow.

The preserve's uplands are fascinating, but the focus remains the river. Like the terrestrial habitats, it too has various niches. Riffles yield to rapids, followed by quiet pools. Frequenting calm water, kingfishers hover before plummeting after unsuspecting fry. In contrast, water ouzels—small, plump, slate-gray birds—haunt the riffles where they walk underwater hunting for invertebrates.

Equally unusual is the feeding behavior of the common merganser, the largest of North American "fishducks." Shooting the rapids as agilely as the most experienced kayaker, a merganser floats downstream, periodically dunking and swishing its head from side to side. The river explodes in a shower of white water as the bird, spotting a fingerling, zig-zags in hot pursuit with its head immersed. It reverses direction as easily as the fry and can propel itself upstream against stiff current. When the chase ends the bird resumes its effortless ride until the next fish tempts it to defy the current.

The river also draws mammals. Ringtails, a small 30-inch fur-bearer whose length is half tail, frolic near and under the preserve cabin, coming close to being the sanctuary's mascot. Mink patrol the streambanks and the river, their tastes ranging from birds to crawfish. By far the most aquatic of the McCloud's mammals is the river otter. Slithering over hidden rocks, otters can swim submerged for some distance. At other times they appear almost reptilian, rhythmically breaking the surface as they hump along upstream.

Aside from the Dolly Varden, the sanctuary hosts another unusual species. Two years ago preserve steward Tom Hesseldenz discovered an extension of a 15-mile limestone outcropping. Endemic to the outcrop is the Shasta salamander, a species which, while not in imminent danger of extinction, is officially listed as rare by the Cali-

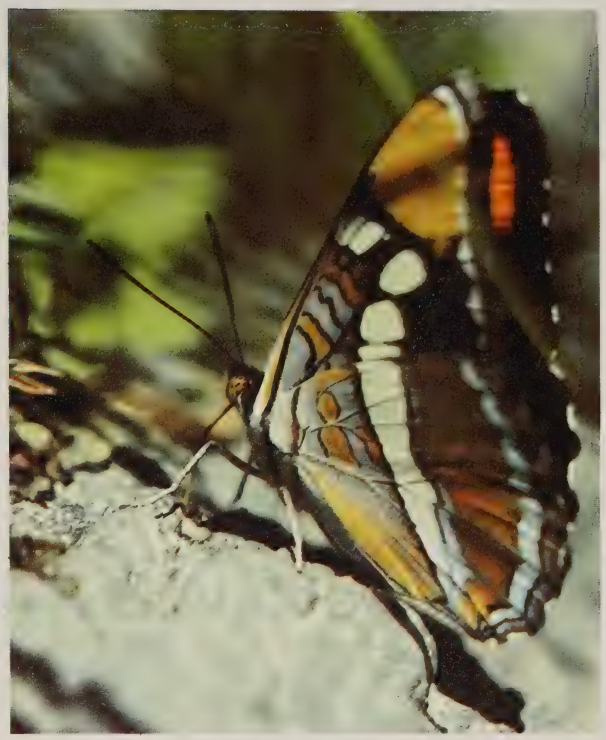
fornia Fish and Game Commission. These rarities are a bonus; more important is the existence and preservation of a healthy ecosystem.

There have already been skirmishes—inherent in protecting the area—with victories and defeats. The U.S. Forest Service's proposed alignment of the Pacific Crest Trail, a hiking path running from the Mexican to the Canadian border, originally came very close to the McCloud River. The trail's placement would have created numerous management problems, including trespass, illegal fishing, and camping. The Conservancy worked closely with the Forest Service and succeeded in relocating the trail farther up slope.

The Conservancy won a second important contest when Pacific Gas and Electric requested permission to reduce flows from the McCloud Reservoir (lying upstream from the preserve) by 50 percent—an action which would have had a devastating effect on the entire riparian system. While the Conservancy successfully opposed the proposal, the long-term problem remains. As long as demands increase for hydro-electric power and other water-related needs, similar proposals may again surface.

Finally, the Conservancy lost its attempt to win wilderness designation for U.S. Forest Service land

Top: Black-tailed or mule deer, prey to local mountain lions, abound in the preserve. Their paths drop to the river's edge, where they come to drink and forage; above: the yellow monkey-flower, an aquatic member of the snapdragon family, flourishes near the McCloud.



Left top: white alders line the lower McCloud as it meanders through the preserve, their vigorous growth checked by winter flooding; below: the vivid triadic coloration of the docile California mountain kingsnake resembles that of the venomous coral; above: winged pageantry—California sister butterflies gather at mossy seeps along the river.

within the McCloud drainage. Logging on slopes above the river could have a serious impact on fish and other wildlife. Consequently, Conservancy staff members continue to work with the Forest Service to prevent activities that would adversely affect the river. Forest practices and instream water rights for wildlife are the two critical issues on the McCloud. Both require constant vigilance to assure maintenance of the preserve's integrity.

The Conservancy is working to protect the McCloud River, first and foremost for the species inhabiting the area, and secondly, for people who appreciate nature's creation. One such person lives nearby in the town of McCloud, a millworker who talked about the beauty of southern Siskiyou County and the need for wild areas where people could experience a renewal impossible in manipulated landscapes. He said, "I'm glad the Conservancy came to the McCloud River. I want my grandchildren to be able to see something that nature created—something that isn't man-made."

Fayette Krause is The Nature Conservancy's Washington Land Steward and a free-lance writer with a special interest in ornithology. **Tom Hesseldenz** is the preserve steward at McCloud River.

Otter Lore

by Greta Nilsson

The stark winter landscape, dominated by stillness, seems devoid of life. Yet signs of activity are evident: mystifying tracks dot the snow—wide pugmarks in small groups followed by long slide marks, often ten or more feet in length. Only one creature in North America leaves such traces of its travels, the exuberant and fascinating river otter, *Lutra canadensis*. Singly or in family groups, otters cover many miles of terrain, alternating between rapid leaps and snow-sliding.

As a member of the weasel family, *Mustelidae,* the river otter is closely related to minks, ferrets, fishers, skunks, and wolverines. It is, however, the only mustelid uniquely adapted to an aquatic environment. The otter's very muscular body, three to four feet in length, and its powerful rudder-like tail propel it through water with remarkable speed and agility. Webbed feet guide its streamlined body underwater, but most of the animal's propulsion is derived from its internal musculature and by the vertical flexing of its strong tail. Swimming in rapid, acrobatic maneuvers, the otter pursues its prey. It is aided in murky water by sensitive whiskers, and catches fish and crustaceans in its sharp, pointed canines.

Weighing about as much as a medium-sized dog, 15 to 20 pounds, the river otter is smaller than its cousin, the sea otter. Males are the larger of the sexes; females tend to be approximately one-third smaller. In northern areas of North America, otters are somewhat larger than southern specimens, following the typical mammalian pattern of heavier body weight in colder environments.

Because the otter's fishing ability is keen, many people misunderstand its true diet, especially fishermen, who regard the river otter as a competitor for game fish. Izaak Walton, in his 17th century book, *The Compleat Angler,* quoted a fisherman, ". . . my purpose is to bestow a day or two in helping to destroy some of those villainous vermin; for I hate them perfectly, because they love fish so well, or rather, because they destroy so much, indeed, so much, that in my judgment, all men that keep otter-dogs ought to have pensions from the King to encourage them to destroy the very breed of those base otters, they do so much mischief."

Prejudices of this type have resulted in outright persecution of otters, both in Europe and in North America. In New Hampshire in the 1930's, otters were trapped by fish and game officers along streams stocked with trout; and even today many fishermen shoot otters. Fish and game departments have neglected to inform the public of scientific studies of otter diets, begun as early as 1942, showing the species' marked preferences for slow-moving forage fishes such as suckers, mudminnows, and sticklebacks. Some game fish like trout are taken, but studies have established that these species make up a small percentage of the otter's diet. A 1955 study by Richard Ryder examined stomachs of otters trapped in Michigan and found forage fishes (primarily mudminnows) in 56 percent, crayfishes in 22 percent, amphibians in 17 percent, insects in 13 percent, and trout in 13 percent of all otters examined. Ryder concluded that these mustelids are opportunistic feeders, catching prey items in proportion to their abundance and in inverse proportion to their swimming ability, thus actually *benefiting* game fish by removing competitive, overpopulated fish species from streams. Other occasional otter food items include turtles, ducks, coots, and even blueberries and other vegetation.

Naturalists and scientists have agreed that otters do not spend the majority of their time catching food. Recent field research reveals that the animals alternate between periods of activity and rest throughout the day and night. While moving about, otters deposit scent to mark territory, and "haul-out" frequently for feeding and resting. Besides "haul-out sites" other areas are used for rolling—Maryland otters in the salt marshes of the Chesapeake Bay choose grassy areas to roll about in. As early as 1932, naturalists were puzzled by seeing otters rolling in waterfowl nests. In Yellowstone National Park, an otter was observed climbing into the large nest of a trumpeter swan and rolling about vigorously for several minutes. When investigated, the nest was found intact and all five eggs undamaged, but rolled to one side. These "roll-out sites" may be used to condition fur, or perhaps just to get a good scratch!

The river otter is superbly adapted to its environment. Ed Park, in *The World of the Otter,* described an encounter with a wild specimen while he was fishing: "I was standing on the bank . . . when I noticed a dark object far up the river, floating downstream toward me. At first I thought it was a log, but then I quickly realized it was an animal . . . an otter—a lone adult of medium size. The river above my pool dashed through a dangerous-looking series of rapids, splashed over and between the rocks, finally ending in a long, swift channel that emptied into the quiet pool before me . . . I found myself tensing with anxiety for its safety. I needn't have worried. The otter came through as if it had done it many times

before—and it probably had—easily following the main current, avoiding all rocks, and apparently enjoying the free ride to the fullest. It swam no more than necessary to avoid the rocks, merely floating along on its belly, head up, relaxed, and looking around. Down the last wild chute it came and out into the quiet water, still not swimming, but gliding from the momentum. Then, almost lazily, it stroked a few times with one hind foot, cruised easily down the length of the pool, and once again entered the faster water that took it down river and out of sight."

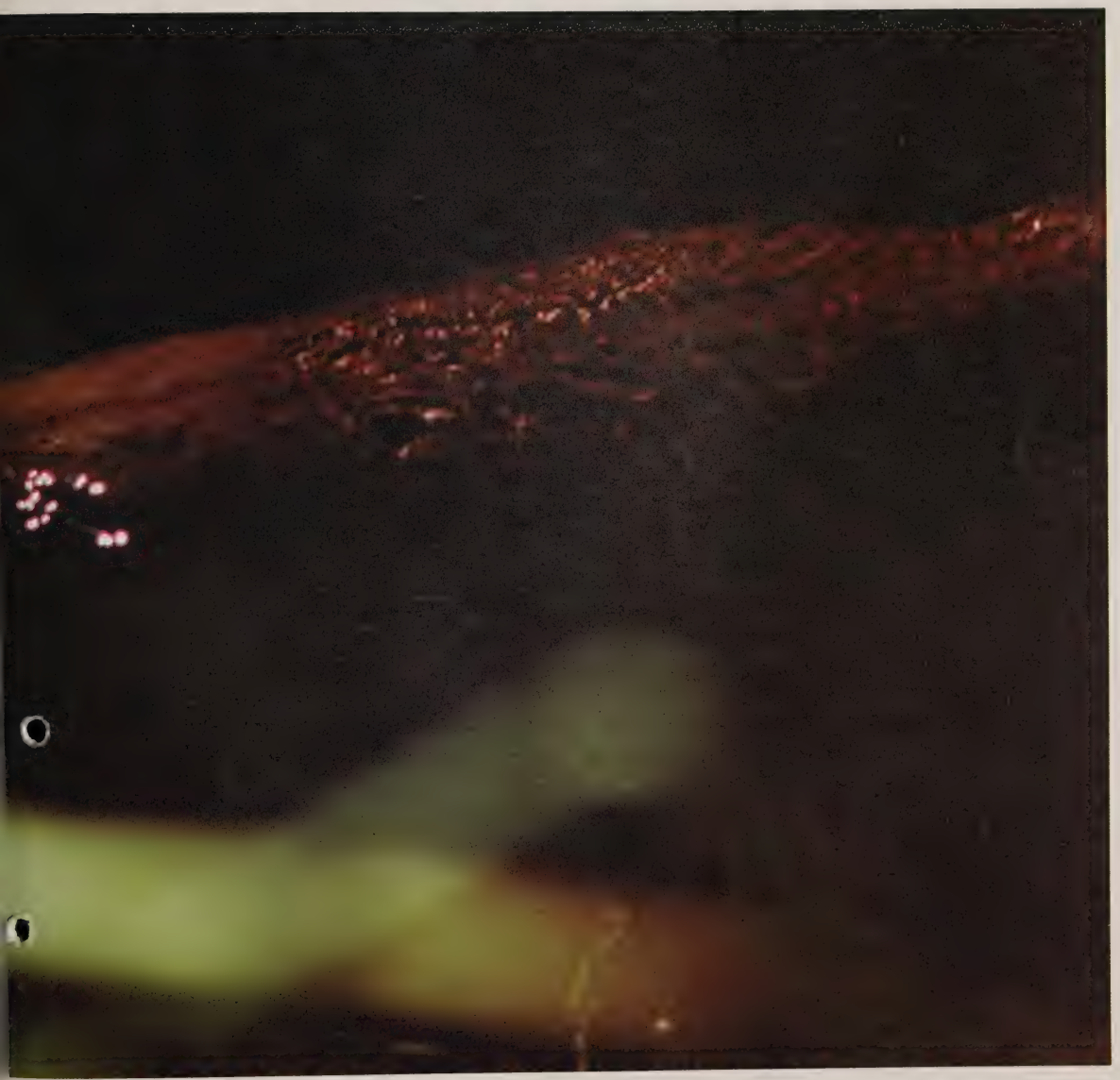
Playfulness in wild animals has been much debated among animal behaviorists, and a clear-cut definition has not emerged. Is the otter playing when it wrestles and ducks its fellow otters, or spends hours balancing a pebble on its nose, dropping it only to retrieve it again, or sliding down mud or snow banks? For the layman, such activity certainly appears to be sheer recreation, but it also serves to train the otter in adroitness, speed, and agility. Numerous books describe the dexterous and boisterous games played by captive otters. C. J. Harris, author of *Otters,* had an otter that enjoyed a game with an ice cube, which was placed on the arm of a sofa. The game's object was to flick the ice cube past one's opponent and onto the floor. In man vs. otter, the "otter was very good at this game and frequently won it; this was perhaps just as well, for if beaten too often he sulked!"

Young otters are most often observed at play, and close-knit groups of otters tumble and wrestle together. The young usually remain with their

mother until she has pups the following spring. Female otters breed at two years of age, although Emil Liers, who bred otters in Minnesota for many years, had an otter that bred at one year, three months.

Among captive otters, females are highly selective in choosing their mates, often rejecting males placed with them. Emil Liers found that 46 of his male otters were never successful breeders and male otters generally did not find mates until they were at least five to seven years of age. Mating occurs in spring, just after pups are born, and through a process known as delayed implantation, fertilized eggs remain unattached to the uterine wall and do not implant to grow to maturity until late winter. The actual gestation period is thought to be two months. This phenomenon allows the female to reabsorb eggs if conditions are not ideal for raising young. Also, recent evidence indicates that some mature females do not have young every year.

In northern areas, young are born during late March or early April in litter sizes ranging from 2 to 5 pups, with an average of 2.7 based on numbers of near-term young taken from trapped females. The female has her pups on a riverbank den, tree stump, or shares a lodge with the tolerant beaver. Sometimes otters select abandoned fox dens with a labyrinth of entrances. One otter being radio-tracked in Idaho denned so deeply underground that the receiver could not pick up signals except when she emerged to obtain food. The male is never present when pups are in the den. Observations of captive otter females have revealed that males were not allowed to rejoin the family until



the young were almost five months old. Otters are excellent parents and will fiercely defend their young if threatened. In one case, a biologist in California observed a male otter who took charge of half-grown pups when his mate was killed in a trap.

Wayne Melquist, who is conducting doctoral thesis work on wild otters in Idaho, has shown through his radio-tracking research that there seems to be little territoriality among females and their young. Otter families are observed in close proximity, and group association occurs—pups are seen one day with their mother and the following day with another family group. There is a great deal of interaction between young otters whether related or not, and pups readily play with the other otters they encounter, including yearlings and two-year-olds. Several family groups have been seen in Melquist's study area, foraging in the same territory. Adult males, on the other hand, have remained more of a mystery and appear to be loners for most of the year.

While as many as 30 to 40 otters occupy the research area in Idaho—at a density of approximately 3 to 4 square kilometers per animal—actual territory size for varying types of habitat is only now being scientifically established. Radio-tracking, by the surgical implantation of small transmitters in otters' abdominal cavities, is being carried out in three areas: west-central Idaho, northern California in Redwood National Park, and in Louisiana. (Since otters' necks are wider than their heads, radio-collars are not feasible, and harnesses present the danger of entanglement with branches. The implantation technique, which does not harm the animal, was developed by Wayne Melquist.) Preliminary evidence indicates that the highest otter density is in Louisiana, where swamps and bayous provide excellent habitat. Dryer regions, such as the Southwest, provide only marginal habitat.

In evolutionary terms, the river otter is a highly successful species because it has adapted to a wide variety of climates and environments. Other than humans, otters appear to have no natural enemies and have a long life expectancy. Captive specimens have lived up to 23 years of age. A wild otter road-killed recently in New York State was determined by tooth analysis to be 18 years old.

Once very numerous and highly visible in North America, otters were found throughout the continent, except for certain parts of the arid Southwest. However, after three centuries of trapping, shooting, habitat destruction, and pollution of its environment by toxic chemicals, the river otter occupies a mere fraction of its original distribution. It has disappeared from the central United States, from West Virginia and Kentucky all the way west to Utah. Only a few scattered populations remain in southeastern Missouri, Illinois, and Arkansas. The early fur trade was responsible for most extirpations: otters became extinct in Kansas, North Dakota, South Dakota, Nebraska, Colorado, and Oklahoma in the late 19th and early 20th centuries. E. Raymond Hall, in his text on Kansas mammals, noted, "The short glossy fur of the river otter has commanded a high price for many years—so high a price that trappers took the very last individuals in our state." The last specimen was killed near Manhattan, Kansas, in 1904. In Indiana, Kentucky, New Mexico, Ohio, and West Virginia, otters had disappeared by the 1950's from combined habitat loss and trapping.

The drainage of millions of acres of wetland, the channelization of countless streams, and the diversion of rivers have removed forever much of the animal's original home. Toxic chemicals now pollute nearly every waterway in the U.S. Their exact effects on the species are not known but presumed highly deleterious. Because it forages to obtain food, the river otter may be ingesting large amounts of these chemicals as well as heavy metals, which are known to accumulate in benthic (riverbottom) fauna. Chemical analysis of otter carcasses has shown higher concentrations of pesticides and heavy metals, such as methyl mercury, than are found in the surrounding environment. The effects of these poisons on otter behavior, reproduction, and longevity have not been researched, reflecting inadequate attention given by state game departments as well as the scientific community to the survival of this unique animal.

The future of the river otter in North America continues to be threatened by demands of the fur industry, as otter pelts now bring the trapper from $50 to $150, and the number of trappers increases yearly, as does the unabated destruction of the animal's habitat. Concerted efforts are being made to protect portions of prime otter habitat, such as The Nature Conservancy's McCloud River Preserve in California. The animal has recently been sighted in Little Black Slough, a Conservancy project in southern Illinois. Perhaps with better understanding of this elusive and declining species, an active program to procure habitat, and the curtailment of pollution and trapping, the river otter will remain an integral part of North America's fauna.

A writer/researcher for the Animal Welfare Institute, **Greta Nilsson** has been doing extensive research on the river otter since 1977. Her published work includes articles and reports for the World Wildlife Fund, National Parks and Conservation Association, and the Animal Welfare Institute.

To Save Nature's Richest Waters

by Richard S. Weinstein

Defined as partially enclosed basins where freshwater from rivers or streams dilutes the saltwater of the open seas, estuaries are among the most important natural areas on Earth. Within these "mixing bowls," the land's topsoils, organic residues, and minerals combine with similar nutrients from the ocean to create a natural environment more fertile than ecosystems either on the land or in the sea. The usually calm, rich estuarine waters harbor many fascinating forms of life, including rare and endangered species.

Creatures thriving in estuaries range from protozoa and plankton to shrimp, oyster, flounder, crab, and lobster. More than two thirds of the commercial and sport fish caught and eaten by Americans today directly depend on estuarine systems. In fact, ecologists have found that many estuaries supply more food per acre than the best Midwestern farmland, and—at the same time—provide at no cost to the taxpayer such services

as wastewater treatment and storm protection.

Estuaries tend to be beautiful places. They are frequently barricaded by sandy spits or other peninsulas, and by barrier islands. Or their semi-enclosed status may be caused by land closing in about their mouths—true of many large bays and sounds, which are just other names for estuaries.

Because of their esthetic qualities and the fact that they often provide excellent shipping lanes, estuaries are in great demand as recreational areas and industrial sites. Consequently, second-home communities, businesses, and new cities are springing up, destroying and damaging estuaries, or greatly reducing their size. *Eighty-five percent* of California's bays and sounds have already been destroyed. In the East Coast's largest estuary, the Chesapeake Bay, the catch of some species of shellfish is one-half that of a century ago, despite the technology of today's fishing industry. Furthermore, matters are not expected to improve, since more and more people are moving to the shorelines; America's estuaries are being urbanized at many times the rate of the rest of the nation.

But the situation is not entirely bleak. The Nature Conservancy is working very closely with a joint federal and state program designed to help preserve estuaries as research and educational facilities. In establishing the National Estuarine Sanctuary Program, through the 1972 Coastal Zone Management Act, Congress planned that the "natural outdoor laboratories" protected would help to educate the public about estuaries and how they are being destroyed. The "labs" are also intended to increase scientific knowledge so that better decisions may be made about protecting and developing estuarine areas. The estuaries preserved under the program must be typical of their geographic regions and scattered around the country so that their benefits may be felt throughout the entire U.S. coastal zone.

The National Estuarine Sanctuary Program designates that the federal government, through the National Oceanic and Atmospheric Administration's Office of Coastal Zone Management, provides grants to states for estuarine preservation. States must match the grants at least equally so that each state itself acquires and manages its estuaries, restricted only by the stipulation that research and educational activities occur. Also, in order that scientists may study the estuaries' naturally functioning systems—and use them as controls against which changes in other, unprotected

Two Conservancy projects in Florida's estuarine waters. Far left: red mangroves, white ibises, and brown pelicans in Rookery Bay, a national estuarine sanctuary; left: an aerial view of Dog Island in Apalachicola Bay.

estuaries may be measured—the sanctuaries must remain relatively undisturbed. Though encouraged by the federal government, preserving habitats for estuary-dependent flora and fauna, including endangered species, is a secondary benefit under the program. Also, low intensity recreation in sanctuaries is advocated, as long as it does not detract from the primary purposes of research and education.

Since its creation in 1972, the National Estuarine Sanctuary Program has established seven sanctuaries. The Nature Conservancy has taken part in setting up five of the areas, and also is contributing to the proposed creation of two more estuarine sanctuaries, which the Office of Coastal Zone Management is evaluating for funding in 1980.

South Slough, Oregon, was the first sanctuary to be funded under the estuarine program. The Conservancy was involved in preserving the slough right from the start, first by assisting the State of Oregon in drawing up a list of candidate sites for sanctuary status, then by helping to select one estuary from that list.

It was an ideal choice. An arm of the much larger Coos Bay, South Slough includes timber land and freshwater marshes among its 4,300 acres. It also has wide and shallow saltwater marshes, which support an extremely high population of bottom-dwelling invertebrates. River otters inhabit the estuary, along with more than 80 species of land and water birds. Over 40 species of trees and shrubs are found in the area. The acreage also encompasses the only major island in the Coos Bay estuarine system that is covered with a climax forest. Historical artifacts include a prehistoric Indian midden and an abandoned gold mine. The slough's research and educational programs are enhanced by a small though well-equipped laboratory, which is affiliated with the nearby Oregon Institute of Marine Biology.

To create the South Slough Estuarine Sanctuary, the Conservancy acquired two large parcels of land from the Georgia-Pacific Corporation, the major landowner in Coos Bay. In two separate transactions, Georgia-Pacific gave the Conservancy approximately 1,000 acres and then sold it an adjacent tract of more than 1,000 acres. The overall effect of both transactions was to preserve over 2,000 acres of the estuary at half the fair market value of the land. The Conservancy later sold the property at cost to the State of Oregon.

The Nature Conservancy also acquired two other areas for the sanctuary, one obtained in a cooperative effort with the Oregon State Land Board. Today, the Conservancy is still involved as a member of South Slough's multidisciplinary management structure, one of the first groups of its kind established to protect such a large natural area.

The Coastal Zone Management Act defines "estuary" to include "estuary-type areas of the Great Lakes." Though it contains only 637 acres, the Old Woman Creek Estuarine Sanctuary on Lake Erie is one of the few relatively undisturbed estuaries left on the lake. Also, in terms of research and education, it is a very active sanctuary. Because it

South Slough, Oregon, a Conservancy project, was the first sanctuary to be funded under the estuarine program: 4,300 acres of woodland and freshwater marshes.

lies within a heavily populated area, its educational program reaches a great number of people. Thousands of school children visit the area each year. Old Woman Creek is the only estuarine sanctuary that has hired its own biologist. In addition, the State of Ohio is currently exploring using the sanctuary as its freshwater research center.

But Old Woman Creek Estuarine Sanctuary may never have been created had it not been for the Conservancy and the work of Charles Corbeil, vice chairman of the Ohio Chapter and chairman of the Chapter's stewardship committee. Primarily through his efforts, the Conservancy managed to bring the state and local organizations together, offered advice, and helped to get funds appropriated for the project. According to Corbeil, the Conservancy provided "inspiration, guidance, and harassment," three ingredients that are vital to many conservation endeavors.

The core area of Florida's Rookery Bay National Estuarine Sanctuary was preserved by a combination of conservation organizations long before the National Estuarine Sanctuary Program existed. In 1964, when massive development threatened the area, local residents formed the Collier County Conservancy, which—with help from The Nature Conservancy and the National Audubon Society—acquired approximately 4,000 acres to protect Rookery Bay. Later in the 60's, the results of major studies of the bay financed by The Conservation Foundation helped persuade decision-makers not to permit land development in the area. Then, when the Estuarine Sanctuary Program and the State of Florida became interested in Rookery Bay, The Nature Conservancy, the National Audubon Society, and the Collier County Conservancy together granted the state a dollar-per-year, 99-year lease of the land for inclusion within a national sanctuary. The state is now in the process of acquiring more land to enlarge the preserve to over 8,500 acres. A ceremony was held early in 1980 designating the area as the Rookery Bay National Estuarine Sanctuary. Along with the other private organizations, The Nature Conservancy figures prominently in the designation document.

The sanctuary encompasses a large mangrove-filled bay and two creeks, along with their drainage corridors, which together provide habitat for a variety of plants and animals. During the designation ceremony, a bald eagle and a brown pelican were spotted flying overhead. The endangered manatee feeds in the bay, along with bottlenose

dolphins; white ibises wade the shallows; white-tailed deer inhabit the uplands.

Also in Florida, the Apalachicola Lower River/Bay Estuarine Sanctuary covers more than 190,000 acres, including within it a state park and a U.S. Fish & Wildlife Service refuge. The river feeding the estuary, the Appalachicola, serves as a major navigation channel for the states of Georgia, Alabama, and Florida. Because of these various state and federal affiliations, the sanctuary's establishment represents a unique cooperative effort in ecosystem preservation. The sanctuary offers protection to leatherback and loggerhead sea turtles, alligators, wild turkeys, bald eagles, and ospreys. Apalachicola Bay also is renowned for the Florida oyster, producing almost 90 percent of the state's oyster harvest.

The Nature Conservancy played a role in the formation of the Apalachicola Bay Sanctuary by purchasing St. Vincent Island in the 1960's and transferring it for management to the U.S. Fish and Wildlife Service. Containing freshwater ponds, tidal marshes, and 15-foot-high sand dunes, the island is now part of the sanctuary. The Conservancy also has obtained an option to purchase Dog Island—one of the barrier islands enclosing the bay—which has a lush interior wilderness. When acquired, it is anticipated that the island will be included in the estuarine sanctuary as well. The Conservancy launched a $2 million fund-raising campaign last March to meet the deadline date of September 1980 to exercise its option on Dog Island. The Apalachicola Lower River/Bay Estuarine Sanctuary has been called "one of the largest remaining naturally functioning systems in the nation."

A major California estuary relatively untouched by development, Elkhorn Slough encompasses some 2,500 acres of tidal flats, submerged and semi-submerged land, and the second largest salt marsh in the state. The slough offers refuge for a variety of animals, from fascinating mud-dwelling invertebrates, to harbor seals and sea lions, to 73 species of fish. An integral link in the Pacific Flyway, the estuary "boards" or harbors many birds, including three endangered species: the brown pelican, California least tern, and the state's shy clapper rail.

Elkhorn Slough is a true estuary only in the winter rainy season when runoff waters from nearby hills bring fresh water to the tidal channel. When referring to the area's high salt concentration, a researcher called Elkhorn "a portion of the ocean bottom conveniently located for study." The estuary is a well-known area for scientific research, not only because of the nearby Moss Landing Marine Laboratory, but also because scores of local colleges and universities use the slough for classes and field trips.

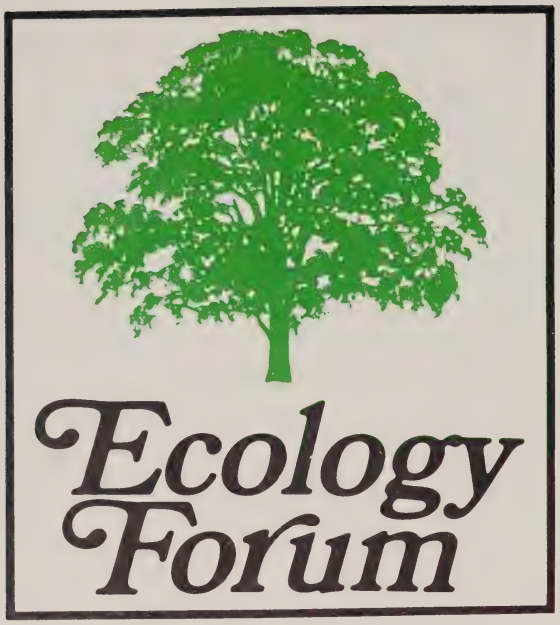
The Nature Conservancy has been involved in saving Elkhorn Slough since 1968, and made its first purchase there in 1971, acquiring a 120-acre area known as the Lillian Devendorf Hohfeld Preserve. Now totaling 441 acres, the Conservancy's land has been included in the Elkhorn Slough Estuarine Sanctuary, which—with Apalachicola—is one of the two most recently funded sanctuaries under NOAA's program. The Conservancy will also be a member of the sanctuary's advisory committee.

Two proposed estuarine sanctuaries, which are likely to receive funding in the near future, have already captured the Conservancy's interest. Padilla Bay, within Washington State's Puget Sound, embraces one of the largest nesting areas on the Pacific Flyway. Unfortunately, efforts to acquire lands for the recommended 12,000-acre state sanctuary have been thwarted so far. But despite substantial problems, the Conservancy has tentatively earmarked a $210,000 revolving fund for use in saving Padilla Bay.

An anticipated Rhode Island estuarine sanctuary will be established within the boundaries of Narragansett Bay, where shoreline residents should benefit greatly from the sanctuary's research and educational program. Wildlife, meanwhile, will benefit from protection of the estuary. An unusually large rookery, which supports heron, ibis, egret, and osprey, exists on one of the islands to be included in the area; seals winter on nearby rock outcroppings. The Conservancy purchased Patience Island for the sanctuary early this year and will sell it to Rhode Island when the state receives its funding from NOAA. Already acquired by the Conservancy and transferred to the state at a substantial bargain sale, the northern end of Prudence Island will be part of the proposed sanctuary as well.

NOAA's National Estuarine Sanctuary Program is not the only ongoing effort to protect the country's bays, sounds, and estuaries, but it is a major one. By combining federal, state, and Conservancy endeavors in the coastal zone, we stand a good chance of saving a few of these vital "mixing bowls"—nature's richest waters.

A writer/editor for the Office of Coastal Zone Management, **Rich Weinstein** is also a freelance writer, specializing in science fiction. His articles and stories have appeared in such books and journals as *Steller Short Novels, Equus Magazine,* and *Coping with the Coast.*



No. 37

by Robert E. Jenkins
Vice President, Science Programs

AQUATIC SYSTEMS AND PRESERVE DESIGN

Water is chemically necessary to all life. It is also a medium in which organisms live and life-giving substances are supported. Water flows through ecosystems, affecting and being affected by every other component. Because it consistently runs downhill, it is more predictable, more easily controlled than air—the other great medium. For these reasons, success in selection, design, and maintenance of ecological preserves—whatever the species or communities targeted for protection—often hinges on proper assessment and handling of the aquatic systems involved.

In general, we must deal with three major aquatic factors in designing preserves: water flow (or hydrology), the physical and chemical condition of the water itself, and the composition of the biotic community. These factors are partly interdependent but will be discussed individually to avoid confusion.

Since most damaging influences gravitate downstream, we try to protect the upper watershed. Though large aquatic systems are usually beyond the scope of our control, small systems can often be acquired intact. Where this is not possible, it may still be worthwhile establishing a preserve, even though design and successful stewardship may be significantly more difficult.

Of the three key factors outlined above, water flow (amount and periodicity) is the easiest to measure. By evaluating present and potential land and water uses in the upper watershed, hydrological changes can be foreseen and control strategies devised. The clearing of land upstream can temporarily or permanently alter natural runoff and percolation (seepage) patterns. Other uses that may disrupt flow include direct withdrawals of water from the system, pumping of groundwater, channelization, wetland drainage, desnagging (the removal of logs and other debris from a watercourse), and impoundment.

In considering threats to the water flow of a particular system, it is always important to seek low-cost solutions. Accordingly, the first step is to find out if such watershed alterations are legal, and to explore specific enforceable riparian and water laws and regulations. Since these vary widely from region to region, a thorough legal review should be standard operating procedure for appraising the aquatic systems of projected preserves. Once the limits of legal restraints are known, it may become apparent that additional upstream protection is necessary to buffer the proposed preserve. This may be gained through conservation easements, contractual agreements with landowners, the formation of watershed associations, and other non-acquisition methods. Such controls can be applied to maintenance of natural vegetation along streambanks, specification of acceptable forestry practices, establishment of minimum lot sizes for development, and other matters influencing the hydrological cycle.

The second factor—physical and chemical condition of the water—involves a much more complex array of possibilities. Upstream land uses can have effects of escalating severity and duration on four main variables: water temperature, turbidity (the amount of suspended particulate matter in the water), organic nutrient concentrations, and the presence of toxic substances. Alteration in any one of these variables can be devastating to the ecology of downstream water bodies—and the possible causes are myriad.

For example, the removal of vegetation near a watercourse for land development is apt to increase siltation and to raise summer water temperature peaks by reducing shade along the stream. Beyond this, residential runoff may introduce into the water organic or toxic substances from lawn fertilizers, herbicides, pesticides, and inadequate sewage treatment.

Another upstream alteration hazardous to water conditions is rotation forestry, which may cause turbidity and long-term temperature increases, bring about changes in the nutrient cycle, and discharge toxic residues. Crop agriculture can spell permanent turbidity, temperature increase,

and chronic contamination from herbicides or pesticides. Mining can be destructive to a watershed in all of these ways and holds the further threat of prolonged damage from acid mine drainage. Even salt from highway de-icing and lead from auto exhaust find their way into the water; and utility corridors can raise the water temperature, increase turbidity, emit toxic substances, and perpetrate catastrophic pipeline spills. Industry can produce nearly all of the aforementioned effects with added dangers from a widening spectrum of toxic chemicals.

Since many of these upstream land uses cannot be tolerated if a healthy aquatic system is to be maintained, it would be best to exclude them from the watershed of a preserve entirely. Otherwise, legal recourse should be considered, and all other forms of limited control employed to piece together efficient safeguards for preserve ecology. In the worst cases, preserve establishment simply won't be feasible—and we are well advised to concentrate our limited resources elsewhere.

As for alterations directly affecting a watercourse's biotic community, what happens downstream is just about as dangerous as what happens upstream. Exotic game fishes, bait species, and pestiferous water weeds that have been introduced into the area may travel upstream as well as down. And since downstream contamination (thermal or chemical) and structural barriers can interfere with critical species migrations, their effects are felt throughout the system. Downstream influences of this nature may be extremely difficult to protect against, as they can operate miles and miles from the headwaters—or even in the oceans themselves —far beyond the reach of our acquisition or control. However, some may be susceptible to structural counter-measures. Though repugnant to many conservationists, these *can* be used with quite specific and beneficial results. Electrical barriers against lampreys in the St. Lawrence River, for example, have permitted formerly depleted fish populations to recover.

In certain cases, structural approaches might mitigate upstream influences as well. Temporary biological refuges against episodic disruptions might be created, for instance, where they don't naturally occur. In other situations, artificial settling basins, periodic shunting devices, low flow augmentation impoundments, drought pools, and the like may be the only hope for restoring earlier hydrological cycles or maintaining endangered species habitats. Other interventions, such as species reintroductions, campaigns against intrusive exotics, drastic biological purging, liming of acid waters, oxygenation of eutrophic ponds, channel reconfiguration, riparian revegetation, silt scouring, gravel deposition, and bottom resnagging, may sometimes be justifiable as well. But these are more properly the province of system restoration than of preserve design.

The role of aquatic systems in preserve design is a vast topic, deserving far more discussion than these pages afford. As we attempt to maintain ecological diversity on our shrinking natural acreage, we must be acutely sensitive to the health of our waters. To successfully apply what we know about assessing aquatic systems will be a formidable challenge to our management abilities, and a host of scientific unknowns should make us doubly careful in designing our preserves. Until new research offers further answers, we can only apply cautious, commonsensical approaches—hoping to make marked improvements in the efficiency and effectiveness of our conservation technology.

A giant land tortoise may live as long as 150 years, protected by the shell it carries on its back.

People have shorter life spans, but they also seek protection—often in the form of life insurance. Unlike the tortoise, which requires its shell throughout its life, people may outgrow their need for life insurance. Children finish school . . . mortgages are paid . . . dreams are fulfilled . . .

If you contribute your life insurance policy to The Nature Conservancy, you help us fulfill *our* dreams of protecting wild places and their inhabitants. And you are provided with a charitable income tax deduction.

For further information, please contact Mrs. Joseph C. Hoagland, Jr., The Nature Conservancy, 1800 North Kent St., Arlington, VA 22209 (703/841-5343).

NEW PROJECTS

Arkansas

OZARK NATIONAL FOREST (Stone County). Fronting three and a half miles of the White River, this 440-acre inholding is home to black bears, beavers, and wild turkeys. Purchased in cooperation with the U.S. Forest Service, to which it has been transferred for addition to the national forest, the land is primarily hardwood forest (tupelo gum and ash) with a large sinkhole lake and some pastureland.

Georgia

BANKS LAKE (Lanier County). The largest freshwater lake-swamp complex on the coastal plains of Georgia, the Banks Lake area spans 3,540 acres in the southern part of the state. Thought to be a Carolina Bay—a shallow, pond-like depression also known as a whale wallow, a loblolly, or a black bottom owing to the mystery of its origins—Banks drains north into a tributary of the Alapaha River. Before the Conservancy purchased them, the lake and wooded wetlands (pond cypress, cypress-black gum) were threatened with drainage for log and stump-wood recovery, action that would have had serious consequences for area inhabitants such as the American alligator, great blue heron, wood ibis, American egret, anhinga, and a variety of wintering waterfowl species. Well-documented cougar sightings suggest that the endangered feline may maintain a breeding population here. A Georgia Heritage Trust site and a proposed National Natural Landmark, Banks Lake is also listed as a unique ecological area by the U.S. Fish and Wildlife Service, which currently holds a lease on the preserve.

Idaho

BIG BAR RANCH (Adams County). The 302-acre private inholding in Wallowa-Whitman National Forest, purchased for transfer to the U.S. Forest Service, encompasses part of a reservoir (with a small island) and grassland containing a climax wheatgrass association. Red-tailed and ferruginous hawks frequent the area, bald eagles use it for their winter roosts, and rainbow trout and smallmouth bass thrive in its waters. Big Bar Ranch will be incorporated in the Hell's Canyon National Recreation Area.

SILVER CREEK—Addition—(Blaine County). From sagebrush-covered hills to meadowland to willow-lined streambanks, the 800-acre Stalker Creek addition to the Conservancy's 479-acre Silver Creek Preserve supports an extraordinary diversity of birdlife: sandhill cranes, Canada geese, marsh hawks, goshawks, golden eagles, bald eagles, osprey, prairie falcons, great blue herons, black-

crowned night herons, as well as five species of owls. Here in an otherwise arid, flat valley, Stalker Creek—one of Silver's three major tributaries—forms part of an exceptionally rich spring-creek ecosystem and trout fishery. Though it provides only one fourth of Silver Creek's flow, Stalker is accountable for well over half the siltation threatening the preserve's aquatic life. Having purchased this sizable property, the Conservancy plans to resell one portion of the agricultural land subject to a protective conservation easement and to farm another portion itself—in a manner that will enhance Silver Creek's natural values. The preserve, just southeast of Sun Valley, is managed by the Silver Creek Preserve Committee and a resident land steward.

Indiana

SPICER LAKE (St. Joseph County). Envision a floating forest—a young swamp forest (maple, gum, elm) and a shrub swamp that is ponded all year long. It lies in extreme northern Indiana: a non-adjacent 50-acre addition to Spicer Lake, protected by the Conservancy in 1978 and now a dedicated state nature preserve. The tract's native ecosystem—a eutrophying kettle-lake basin—hosts numerous bird species (herons, ducks, rails, and warblers in profusion) and buffers the existing 40-acre preserve, which is a textbook example of current lake succession. The property will be transferred either to the Indiana Department of Natural Resources for management as a wetland conservation area or to the St. Joseph County Park and Recreation Department for inclusion in the existing preserve. The Indiana Chapter has embarked upon a $23,000 fund-raising campaign for the project.

Minnesota

HOLE-IN-THE-MOUNTAIN PRAIRIE—Addition—(Lincoln County). Forty acres, acquired by the Conservancy in exchange for nearby cropland, enhance the existing preserve—a sloping, stream-dissected prairie remnant in southwestern Minnesota. Habitat for the Dakota skipper butterfly—a candidate for federally threatened status—the pawnee skipper, ottoe skipper, and others, Hole-in-the-Mountain now stands at 222 acres: a large enough area to afford long-term protection for prairie flora and fauna. The preserve is managed by the Minnesota Chapter.

MORGAN WOODS — Addition — (Washington County). Yet another gift of Samuel H. and Natalie P. Morgan, a 20-acre tract enlarges Morgan Woods—bringing to 80 acres this rugged, rolling deciduous forestland preserve. In scattered openings, characteristic prairie plants thrive, including little and big bluestem grasses and lead plant. The area (a superb example of kame and kettle topography, shaped by glaciation some 20,500 years ago) has been transferred to the Science Museum of Minnesota for administration by the Lee and Rose Warner Nature Center.

Ohio

UPPER CHAGRIN—Addition—(Geauga County). The addition of a wooded bluff overlooking the Chagrin River, which cuts through the existing preserve, helps protect a high quality watershed. A beech-maple forest association, typical but fast disappearing in the state, characterizes the preserve as a whole: 151 acres including this 30-acre property. Funds for purchase of the tract were donated by Mr. and Mrs. R. Preston Nash III. Upper Chagrin is managed by a local volunteer stewardship committee with assistance from the Ohio Field Office.

Rhode Island

PATIENCE ISLAND (Newport County). A Narragansett Bay island with steep, rocky shores, a heavily wooded interior, and a salt marsh rich in aquatic life—Patience is a key component of the state's Bay Island Park. The 208-acre area is a haven for white-tailed deer, least terns . . . and a stop-over point for migratory waterfowl. Lying just west of the portion of Prudence Island that the Conservancy purchased in cooperation with the state two years ago, Patience is the only Narragansett Bay island where coniferous trees, notably juniper, predominate. The property will be transferred to the Rhode Island Department of Environmental Management.

South Carolina

ASHLEY RIVER ROAD (Charleston County). Twenty-seven acres of pine and oak woodland ribboning the state's oldest continually used roadway are a gift from Georgia-Pacific Investment Company, a subsidiary of Georgia-Pacific Corporation. An Indian trail in pre-settlement days, scenic Ashley River Road now provides access to a number of significant historic sites, including two National Historic Landmarks: 18th century plantations known as Drayton Hall (an earlier Conservancy project) and Middleton Place. Protection efforts date back to the early 1720's, when legislation to protect roadside shade trees was enacted by the South Carolina General Assembly. Widening of the road is still a threat, but the National Trust for Historic Preservation, to which the Conservancy has transferred the land, is working to safeguard additional roadside property in this prime historic district.

Mashomack Preserve

When you fly over the forked tail of Long Island on a clear day, you can see Mashomack: 2,100 acres of untrammeled green—open oak woodlands, marshes, freshwater ponds, and interlacing tidal creeks—edged in white by ten miles of coastline. Here on Shelter Island, just 100 miles east of New York City, the Conservancy's new preserve spans an entire peninsula.

Together with nearby Gardiners Island, the Mashomack area supports the largest concentration of nesting osprey on the East Coast. Its creeks abound in blue crabs and breeding diamondback terrapins. Neighboring colonies of ibises, herons, egrets, and terns feed in its marshes, where muskrats live year-round and numerous waterfowl winter. In the 1,200 contiguous acres of upland forest, there are red foxes and white-tailed deer, great-horned owls, red-tailed hawks, kestrels, occasional bald eagles, and a variety of songbirds.

Negotiations for this outstanding natural area were complex and unconventional. Ownership resided in Aeon Realty Company, which offered to sell all of its stock to the Conservancy as a $10.6 million package. Its assets included developed property in Florida and New York as well as the Mashomack land. In October, the Goodhill Foundation, whose resources come from the estate of the late Katharine Ordway, spearheaded a $6-million fund-raising campaign for the project by pledging to match contributions, dollar for dollar, up to $3 million.

Thanks in part to the Richard King Mellon Foundation, which provided crucial interim financing for the acquisition with a $2-million grant to the revolving Land Preservation Fund, Mashomack became the largest successful project fund-raiser in Conservancy history. In less than five months, the Goodhill challenge had been met, with a flood of donations coming in from 1,600 individuals, corporations, and foundations. Purchase made, some of the Aeon Realty Company holdings (nine Manhattan brownstones) were expeditiously sold to help offset acquisition costs. In recognition of the critical Goodhill pledge, the Conservancy named the southern portion of the new preserve the Katharine Ordway Wildlife Refuge at a mid-May ceremony.

Although federal, state, and local studies—from the U.S. Fish and Wildlife Service's Unique Ecosystem Concept Plan for New York State to the Suffolk County Master Plan—have recognized the superb natural values of Mashomack, it was safeguarded through private action. The Conservancy is currently seeking an additional $500,000 to complete the campaign. With a full-time resident manager and a volunteer stewardship committee to guide preserve policies, a comprehensive master plan in the works, and a growing endowment fund, Mashomack is sure to remain a surprising stretch of green at the edge of America's biggest megalopolis.

Virginia

VIRGINIA COAST RESERVE — Addition — (Northampton County). Rounding out the Conservancy's mainland holdings on Virginia's Eastern Shore, the purchase of 1,170 acres adjacent to Virginia Coast Reserve headquarters at Brownsville protects an entire peninsula and provides a critical waterfront access point for Reserve activities. Half of the property is highly productive tidal wetlands, vegetated almost exclusively with *Spartina alterniflora* (salt-marsh cordgrass). Breeding site for clapper rails and diamondback terrapin, these marshes are wintering grounds for many migratory bird species—black ducks and greater snow geese among them. The internationally recognized Virginia Coast Reserve, one of the Conservancy's most ambitious and successful projects, is managed by a professional stewardship staff. Total acreage now stands at 34,735 acres.

West Virginia

MONONGAHELA NATIONAL FOREST (Greenbrier County). Bordering a quarter mile of Laurel Run, a native trout stream, this 60-acre parcel is primarily steeply sloping oak-and-hickory woodland. Acquired in cooperation with the U.S. Forest Service, to which it will be transferred for inclusion in the adjacent national forest, the property is crossed in one corner by a hiking trail.

Wisconsin

CHIWAUKEE PRAIRIE—Additions—(Kenosha County). This outstanding stretch of wet-mesic prairie extends across a series of ridges and swales on the Lake Michigan coast. In 1965, the Conservancy purchased its first Chiwaukee tract, commencing a long, unflagging effort to assemble a viable preserve. Some two dozen small lots totaling eight acres were recently purchased, bringing Conservancy acquisitions here to 89 acres—nearly half the area of the prairie itself. The Wisconsin Chapter raised more than $18,000 last winter for Chiwaukee acquisitions and is actively soliciting further contributions. A National Natural Landmark and a state scientific area, Chiwaukee harbors over 300 native meadow and prairie plant species. The area is currently managed by the University of Wisconsin, Parkside, with assistance from the Wisconsin Chapter and the state's Scientific Areas Program.

RUSH CREEK BLUFFS—Addition—(Crawford County). Acquisition of this 105-acre north slope property safeguards high quality oak-hickory-walnut woodland, critical buffer for the existing preserve. Sharply sloping ridges offer northern, southern, eastern, and western exposures within this single tract—making it exemplary for forest research. Conservancy acquisitions in the area now total some 1,100 acres, embracing Mississippi River bluffs, dry hillside prairies, and bottomland hardwood forest where the state-threatened red-shouldered hawk nests. The area, which will be conveyed to the State of Wisconsin, is currently managed by the Wisconsin Chapter.

Fall Tours

ADIRONDACK MOUNTAIN PRESERVES

Containing 9,000 square miles in northern New York, the Adirondack Park is the largest protected sanctuary in the continental U.S. It is so expansive that much of its interior land is still relatively unexplored.

The Adirondack tour offers Conservancy members and their guests the chance to visit the Park on the weekend of October 3-5, 1980. You will learn about the role that the Adirondack Conservancy has played in preserving this vast wilderness, stay at the famous and historic Ausable Club, and visit the Conservancy's 12,500-acre Santanoni Preserve within the Adirondack Park. The cost of the trip is $99.00. Don't miss this trip to "the land nobody knows."

VIRGINIA COAST RESERVE

The Conservancy's Virginia Coast Reserve is one of the few segments of our coastline that looks much as it did 200 years ago. The 35,000-acre system contains all or part of 13 islands—all of which support huge concentrations of shorebirds, seabirds, and waterfowl.

The Conservancy is offering its members the opportunity to visit one of these pristine islands. We are sponsoring a trip to Hog Island on the weekend of October 4 and 5, 1980. The cost of the tour is $119.00. It is a rare chance to see not only an area that you have helped protect, but also one of the most unspoiled ecosystems remaining in our country.

For applications and additional details for the VCR tour and the Adirondack trip, write to The Nature Conservancy Tours, P.O. Box 3611, Washington, D.C.; or call 202/466-6307.

From time to time, The Nature Conservancy exchanges membership lists with other conservation organizations whose work might also interest you. In this way, we are able to increase the Conservancy's membership at a lower cost than would otherwise be possible. However, if you prefer *not* to receive these mailings, please attach the mailing label from this magazine (or copy the label *exactly*) and mail it to:

Membership Secretary
The Nature Conservancy
1800 North Kent Street
Arlington, Virginia 22209

MORE ABOUT CROCODILES . . .

Because of publication deadlines and space limitations, the article "Last of the Dinosaurs," which appeared in the March/April 1980 *News,* omitted mentioning a third ongoing effort to protect the endangered American crocodile. Since January 1978 the Florida Power and Light Company has been observing populations of *Crocodylus acutus* at its Turkey Point power plant, only a short croc swim from Key Largo where the Florida State Game and Freshwater Fish Commission is conducting its own study to determine the status of the rare reptile. To date, research completed by Florida Power and Light shows that the crocodile population at Turkey Point is a dynamic one, with numbers of adults and adolescents fluctuating from 12 to 25 individuals. Recruitment of very young crocs into the population is also evident—more hatchlings are being observed in the area. For 1980, researchers hope to acquire a better understanding of the American crocodile's biology, at least for the Turkey Point population.

NEXT IN THE NEWS:
PROTECTING THE LAND

The September/October issue of the *News* will explore a range of innovative land protection techniques that do not involve outright acquisition. Learn about the many ways we're protecting the land—next in the *News.*

Charles P. Bradford

Charles P. Bradford, who was associated with the Conservancy for more than 24 years, died on April 11 in Augusta, Maine, at the age of 75. He left behind an enviable record as an active conservationist. Along with Rachel Carson, Mr. Bradford was one of the founders of the Maine Chapter in 1956. He also served as the Chapter's first chairman, later as a trustee, and as its first executive director from 1972 to 1978. In addition, when he retired from the Maine State Parks Department after 31 years—and 34 parks and historic sites later—Charles Bradford joined the Conservancy as New England Field Representative. In 1979, following his second retirement, he was awarded the first Down East Environmental Award, an annual honor given by *Down East* magazine to encourage the proper use of Maine's natural resources.

To honor Mr. Bradford, The Hermitage—a Conservancy preserve and National Natural Landmark in northern Maine—has been designated the Charles P. Bradford Memorial. In addition, because the Maine Chapter trustees feel that his name should be associated with the continuing protection of land, a series of inland preserves has been established as the Charles P. Bradford Memorial Preserves in a system similar to the Rachel Carson Seacoast. Contributions given in memory of Mr. Bradford have been designated as the basis of a fund for the stewardship and acquisition of inland preserves in Maine.

COTTAGES AVAILABLE AT MILE HI

Modern housekeeping cottages overlooking a mountain creek are available for rental year-round at the Conservancy's Mile Hi Ranch. Located 90 miles southeast of Tucson in the Huachuca Mountains, the Mile Hi stretches across the mouth of Ramsey Canyon, one of the most lovely and biologically diverse canyons in southern Arizona.

To arrange a visit or obtain a brochure and birdlist, write: The Mile Hi, RR 1, Box 84E, Hereford, Arizona 85615. Phone: (602) 378-2785.

PHOTOS: Susan Bournique, pp. 16-17, 19; Ken Dodd, p. 25; Michael P. Gadomski, p. 26; John Hall, p. 5 top; Tim Loomis, p. 6; C. Mellon, p. 28; Tim Palmer, pp. 5 bottom, 8, inside front cover; Phil and Judy Sublett, pp. 4, 7, 14.

NEW LIFE MEMBERS

An individual becomes a Life Member of The Nature Conservancy upon contribution of $1,000 for membership dues.

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A corporation becomes a Corporate Associate of The Nature Conservancy upon contributing between $1,000 and $10,000 annually to the operations of the organization.

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